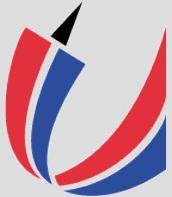




# **Human Effectiveness Directorate**

## **Distributed Mission Training (DMT) Threat Systems**

**Glenn Cicero, AFRL/HEAE**



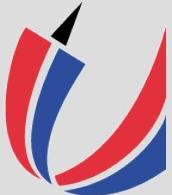
# DMT Threat System

- **Need for new approach to training**
  - **Past simulations supported threat recognition and procedures training only**
    - » **This allowed substantially simplified models to be used (threat models and avionics models)**
  - **Current training requirements exceed basic recognition and procedures requirements**



# DMT Threat System

- Mission Training Requirements
  - Physics-based threat models
    - » Real beam scans modeled
    - » Current Electronic Warfare Integrated Reprogramming-based parametric data
    - » DIA-approved weapon fly-out data and algorithms
      - NAIC Airborne systems/weapons
      - TSMO SAM/C3
      - NGIC AAA
    - » HLA/DIS compliance
    - » Object orientation



# DMT Threat System

- Mission Training Requirements (cont.)
  - Real-Time interaction with environment
    - » Electronic parametrics based on EWIR data
    - » Dynamically calculated terrain clutter
      - Digital Radar Landmass Simulation
    - » Dynamically calculated Doppler velocities
    - » Dynamically calculated atmospheric propagation
      - Weather models
    - » Dynamically calculated Clutter/Free Space detection determination



# Avionics Simulation

- **AN/ALR-69 Radar Warning Receiver**
  - **True bit-wise compatible replication of actual system**
    - » **No “short-cuts”. Line-by-line translation**
  - **Pulse-to-Pulse level replication**
    - » **1/10 microsecond accuracy**
    - » **“Real world” limitations behavior captured**
      - **Anomalous/spurious signal indications**
      - **Late/missed signal detections**
      - **High pulse-density degradation**



# Chaff Model

- Chaff dynamic data as described by SURVIAC documents
  - Frequency dependent Radar Cross Section (RCS)
  - Bloom rates aircraft speed dependent
  - Fall rates/hang time
  - Doppler/Free space clutter
  - Chaff model implementation affects all appropriate entities throughout the network



# AFRL/HEA Accomplishments

- **Created true bit-wise compatible replication of AN/ALR69 radar warning receiver (RWR) running real time**
- **Created threat behavior models that dynamically account for terrain clutter degradation and target actions and reactions (non-scripted)**
- **Threat database modeled with parametric data required to exhibit true physics-based performance characteristics**
- **Basic ECM waveforms modeled**
  - **RGPO, VGPO, Noise, AGWO**



# Fire-Control Radar





# Planned Additions

- Sophisticated ECM waveforms
  - Correlated RBM/VBM
- Incorporate Chaff model (RR-170)
  - Model already developed, need additional hardware
- Incorporate full 6-DOF missile fly-out and threat aircraft aerodynamic behaviors
  - Data in-house now, need additional hardware